

REMARKS

This application pertains to a novel process for separating solid substances, present in dissolved or colloidal form from solutions in a nonaqueous solvent with the aid of a membrane.

The membrane used in Applicants' process has a hydrophobic coating. The hydrophobic coating is produced on the membrane by treatment with silanes (page 4, line 7). The silanes used are those of the general formula $R_1R_2R_3R_4Si$, wherein at least one but at most three of the groups R_1 to R_4 are hydrolyzable groups, e.g. $-Cl$, $-OCH_3$ or $-O-CH_2-CH_3$ and/or at least one but at most three of the groups R_1 to R_4 are nonhydrolyzable groups, e.g. alkyl groups or phenyl groups.

Claims 1-8 and 10-17 are pending.

The claims have been amended to recite solid substances, the molecular weight of which have not be changed. Support for limitation of the claims to the separation of solid substances can be found at page 3, line 17. Support for the limitation requiring that the molecular weight of the substances are not changed can be found at page 3, lines 6 and 7 when read in view of the text at page 2, lines 15 - 19. The expression "size difference" is found at page 2, line 17 and the expression "increased molar mass" (i.e., molecular weight) is found at page 2, line 16. It is therefore clear that within the context of this application, the size

of the substance refers to its molecular weight. On this basis, the reference to an unchanged size of the catalyst at page 3, line 7 provides support for the claim limitation of unchanged molecular weight.

Support for the limitation of the claims to the usage of an asymmetric membrane, comprised of at least three layers with different pore sizes can be found at page 3, line 31 through page 4, line 6.

Accordingly, no new matter is added.

Claims 1, 3-8, 10,11, and 15-17 stand rejected under 35 U.S.C. 102(b) as anticipated by Cohen (US 6,440,309).

As previously pointed out, the Cohen reference is directed to a pervaporation process.

As explained by the Cohen reference, pervaporation is a separation process whereby a liquid mixture is separated based on the preferred solubility and diffusivity of the components of the mixture through an active polymer membrane phase. On the permeate side of the membrane the partial vapor pressure of the species to be removed is maintained at a level much lower than its value under ambient conditions by maintaining vacuum or using a sweep gas (for example, air or nitrogen). The permeating species undergo a phase change (from liquid to vapor) as they diffuse through the membrane and the permeating species are condensed in a cold trap. The process of pervaporation can be used

effectively to separate mixtures of close-boiling point components and it is suitable for the removal of volatile compounds from aqueous as well as organic liquid mixtures. Application of pervaporation technology include dehydration of alcohol-water streams, removal of organic pollutants from dilute aqueous wastes, and separation of close boiling point mixtures and isotropic mixtures.

Clearly, pervaporation is a process whereby liquids are separated and is not a process whereby a solid is separated from a liquid. No person skilled in the art would ever view the process described in the Cohen reference as useful for separating a solid from a liquid, as such a separation would not be based on any differences in solubility in a polymer or vapor pressure. Rather, those skilled in the art would look to a filtration or nano-filtration technique, whereby the liquid would pass through a membrane and the solid catalyst would be retained.

Applicants' claims, as now directed to "solid substances" are clearly distinguished over anything that can be found in the Cohen reference.

Furthermore Cohen teaches that the ceramic membrane can be either homogeneous or asymmetric with "a thin or thick ceramic layer with small pores on top of an underlying ceramic support with larger pores." This implies the existence of two distinguishable layers of different pore size (Column 6 line 66 to Column 7 line 5). A further modification consisting of "thin ceramic support" on each side of the ceramic membrane body will necessarily yield a symmetric

membrane with no further enhanced separation capability, as only the modified top-layer of these membranes facilitates any separation step.

The Cohen reference therefore neither anticipates nor suggests Applicants' amended claims, and the rejection of claims 1, 3-8, 10, 11, and 15-17 under 35 U.S.C. 102(b) as anticipated by Cohen (US 6,440,309) should now be withdrawn.

Claims 1-8, 10, 11 and 15-17 stand rejected under 35 U.S.C. 102(b) as anticipated by Karau, et al (US 6,472,571).

Karau (discussed in Applicants' specification at page 2, line 15 et seq. as EP 1 088 587 A2) describes a process for the production of organic compounds in a membrane reactor.

In their specification, Applicants' point out that:

"Published specification EP 1 088 587 A2 describes the use of ceramic membranes for retaining dissolved catalysts **increased in molar mass** (emphasis supplied) in organic solvents. As a result of enlarging the catalyst, the size difference between the product to be discharged and the catalyst to be retained increases. In addition, good retention, which is not impaired by the wetting of the pore walls with the solvent, can be achieved using larger pores.

The Karau process requires that the molecular weight (i.e., size) of the substance be increased in order for it to be retained by his membrane.

By contrast, Applicants' process is specifically directed to the removal of substances whose size has not been increased. Applicants' process therefore represents a substantial advance in the art as compared to Karau, as there is no need to enlarge the substances in order to enable the process to operate.

Furthermore Karau discloses that any given membrane consisting of an inorganic backing layer and an inorganic interlayer may be used as membrane. (column 3 lines 38-40) Additionally he teaches that the interlayer is being considered as an interlayer by the fact that is being situated between the inorganic backing layer and the newly formed organic layer (column 3, lines 40-50). Hence the employed ceramic membrane of Karau is clearly consisting of only two layers.

No reading of Karau could possibly lead to Applicants' novel process, and the rejection of claims 1-8, 10, 11 and 15-17 under 35 U.S.C. 102(b) as anticipated by Karau, et al (US 6,472,571) should now be withdrawn.

Claims 2 and 12-14 stand rejected under 35 U.S.C. 102(b) as anticipated by Cohen, or in the alternative, under 35 U.S.C. 103(a) as obvious over Cohen as applied to claim 1 above and further in view of WO 01/07157. As pointed out above, the Cohen reference is directed towards a separation of liquid components from each other, and not to the removal of a dissolved solid from a liquid solvent.

The WO reference, on the other hand, is concerned with the separation of catalysts from a solvent.

The process of the WO reference is completely different than that of the Cohen reference, and the Examiner has not explained why any person skilled in the art would think that a membrane designed for a pervaporation process, i.e., for the separation of two liquids from each other based upon a difference in their vapor pressures, would have any use at all for the separation of a solid from a liquid.

There is absolutely no basis upon which the membrane of the Cohen reference would ever be substituted for the membrane used in the WO reference.

Applicants' appreciate the citation of *In re King*. However, the Examiner has not shown where Applicants' process, as presently claimed, is actually taught by the cited references. Unlike the situation in the *King* case, the membrane taught by Cohen does not perform the function disclosed in Applicants' method claims, if used in its normal and usual operation. The normal and usual operation of Cohen's membrane is the process disclosed by Cohen, and this is different than Applicants' process. Applicants' process cannot in any way be seen as the normal and usual operation of Cohen's membrane.

Accordingly, no combination of Cohen and the WO reference could ever lead those skilled in the art to Applicants' novel process, and the rejection of

claims 2 and 12-14 under 35 U.S.C. 102(b) as anticipated by Cohen, or in the alternative, under 35 U.S.C. 103(a) as obvious over Cohen as applied to claim 1 above and further in view of WO 01/07157 should now be withdrawn.

Finally, claims 12-14 stand rejected under 35 U.S.C. 102(b) as anticipated by Karau, or alternatively, under 35 U.S.C. 103(a) as obvious over Karau as applied to claim 2 above, and further in view of WO 01/07157.

As discussed above, Karau requires an increase in the molecular weight (size) of the substance. One would not use the Karau membrane in the WO process without first increasing the molecular weight of the catalyst. The need to increase the molecular weight of the catalyst is a step not required in Applicants' process. Therefore, the Karau reference cannot be seen as anticipating Applicants' claims, and no combination of Karau and the WO reference can fairly be seen as suggesting Applicants' claims. The rejection of claims 12-14 under 35 U.S.C. 102(b) as anticipated by Karau, or alternatively, under 35 U.S.C. 103(a) as obvious over Karau as applied to claim 2 above, and further in view of WO 01/07157 should therefore be withdrawn.

In view of the present amendments and remarks, it is believed that claims 1-8 and 10-17 are now in condition for allowance. Reconsideration of said claims by the Examiner is respectfully requested, and the allowance thereof is courteously solicited. Should the Examiner not deem the present amendment and remarks to place the instant claims in condition for allowance, it is

respectfully requested that this Amendment Under Rule 116 be entered for the purpose of placing the prosecution record in better condition for appeal.

CONDITIONAL PETITION FOR EXTENSION OF TIME

If any extension of time for this response is required, Applicants request that this be considered a petition therefor. Please charge the required petition fee to Deposit Account No. 14-1263.

ADDITIONAL FEE

Please charge any insufficiency of fee or credit any excess to Deposit Account No. 14-1263.

Respectfully submitted,
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